AXIAL LOAD TESTING OF 3-FT DIAMETER DRILLED SHAFTS AT THE CENTURY FREEWAY IN LOS ANGELES, CALIFORNIA

FINAL REPORT # FHWA/CA/TL-94/02

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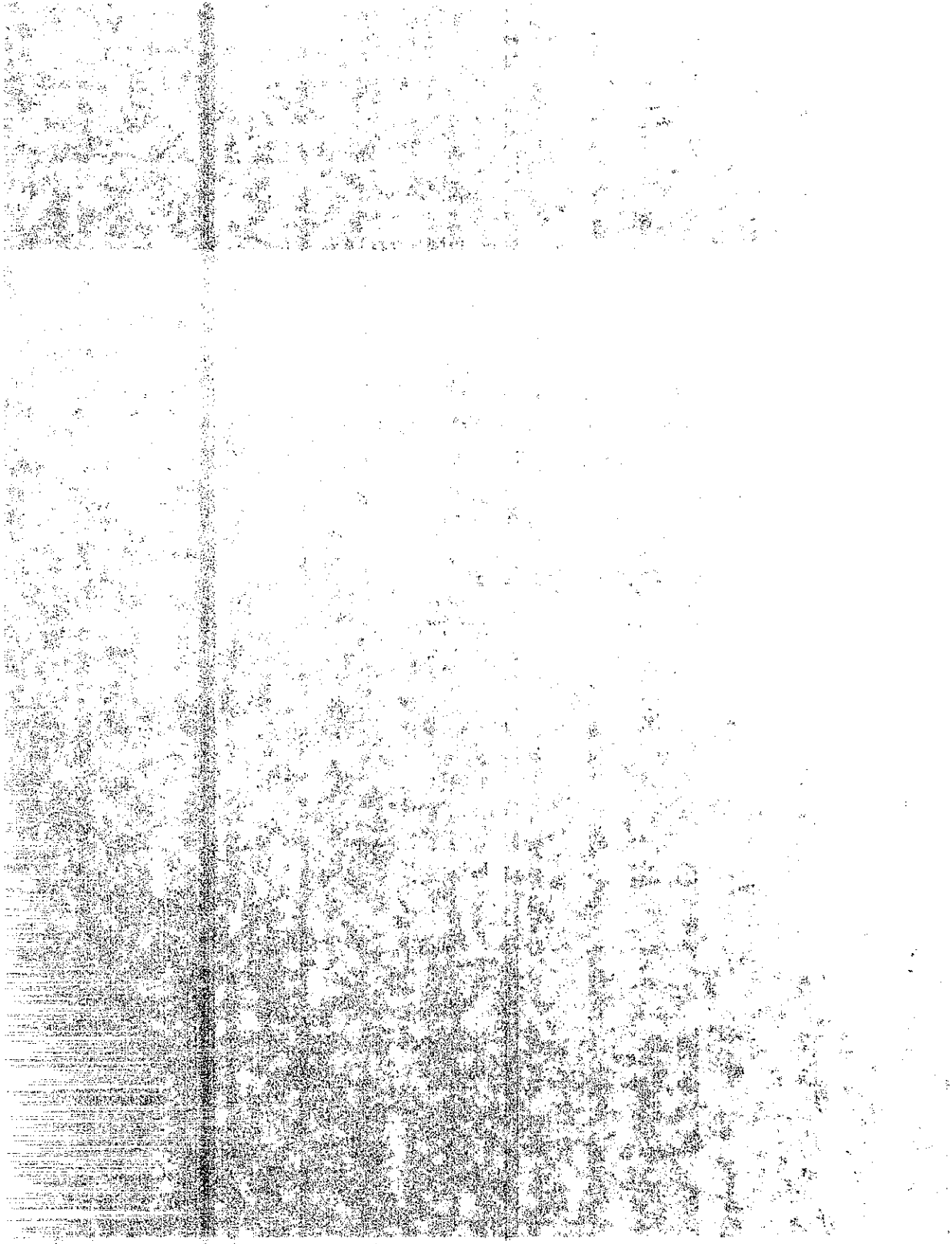

State of California
Department of Transportation
Division of New Technology, Materials and Research
Office of Geotechnical Engineering

Final Report

AXIAL LOAD TESTING OF 3-FT DIAMETER DRILLED SHAFTS AT THE CENTURY FREEWAY IN LOS ANGELES, CALIFORNIA

July 27, 1993

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Principal Field Investigators..... Wilfred S. Yee, P.E., Caltrans
Suneel Vanikar, P.E., FHWA

Work Performed by..... Geotechnical Engineering Branch, Caltrans
Electrical and Electronics Branch, Caltrans
Demonstration Projects Division, FHWA

Report Prepared by..... Clifford J. Roblee, Ph.D., P.E.
Wilfred S. Yee, P.E.

REGISTERED PROFESSIONAL ENGINEER
ROGEL H. PRYSOCK
No. GE001700
Exp. 6/30/97
CIVIL
CALIFORNIA

R.H. PRYSOCK, R.G.E.
Chief, Office of Geotechnical Engineering

Clifford J. Roblee, Ph.D., P.E.
Civil Engineer

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16. Abstract

Results of a static axial load-testing program of two 3-ft diameter drilled shafts installed into a very-competent alluvial profile in Los Angeles, California are presented. Construction difficulties were encountered during installation of one shaft. The shafts were instrumented internally at several levels, and over 11,000 individual measurements were recorded with less than 1% failure. The testing program included backbone loading cycles to high levels of shaft-head displacement, as well as both a multi-day hold of each shaft at ultimate load and a "quick load" test of one shaft. Close assessment of data quality show all measurements to be highly compatible. Shaft-head response is evaluated to establish both the capacity and stiffness of the test shafts. Three displacement-based "failure" criteria are utilized to determine shaft capacities and associated displacements. Shaft stiffness is shown to vary dramatically depending upon both the load level and the loading path. Displacement profiles as a function of load are developed which show that the shafts remained essentially elastic throughout the entire load history. Significant time-dependent shaft-head settlement was measured during the held load, and is attributed to soil displacements rather than concrete creep. Families of load-distribution curves are presented for backbone loading, held-loading, and for both partial and complete unloading. Tip resistance is shown to provide only a small contribution to ultimate shaft capacity. Strata-specific interpretation of unit shaft resistance could not be established due to several factors, however, highly compatible shaft averages are presented. "Site average" curves of both unit shaft and tip resistance are developed which clearly illustrate a difference in the rate of mobilization of these two components with shaft displacement. Design unit shaft and tip resistance values for this site are found to be approximately 1.8 ksf and 2 ksf, respectively, for "failure" defined as a displacement of 0.5 inch. However, considerable additional capacity in terms of both components is clearly developed at higher displacements.

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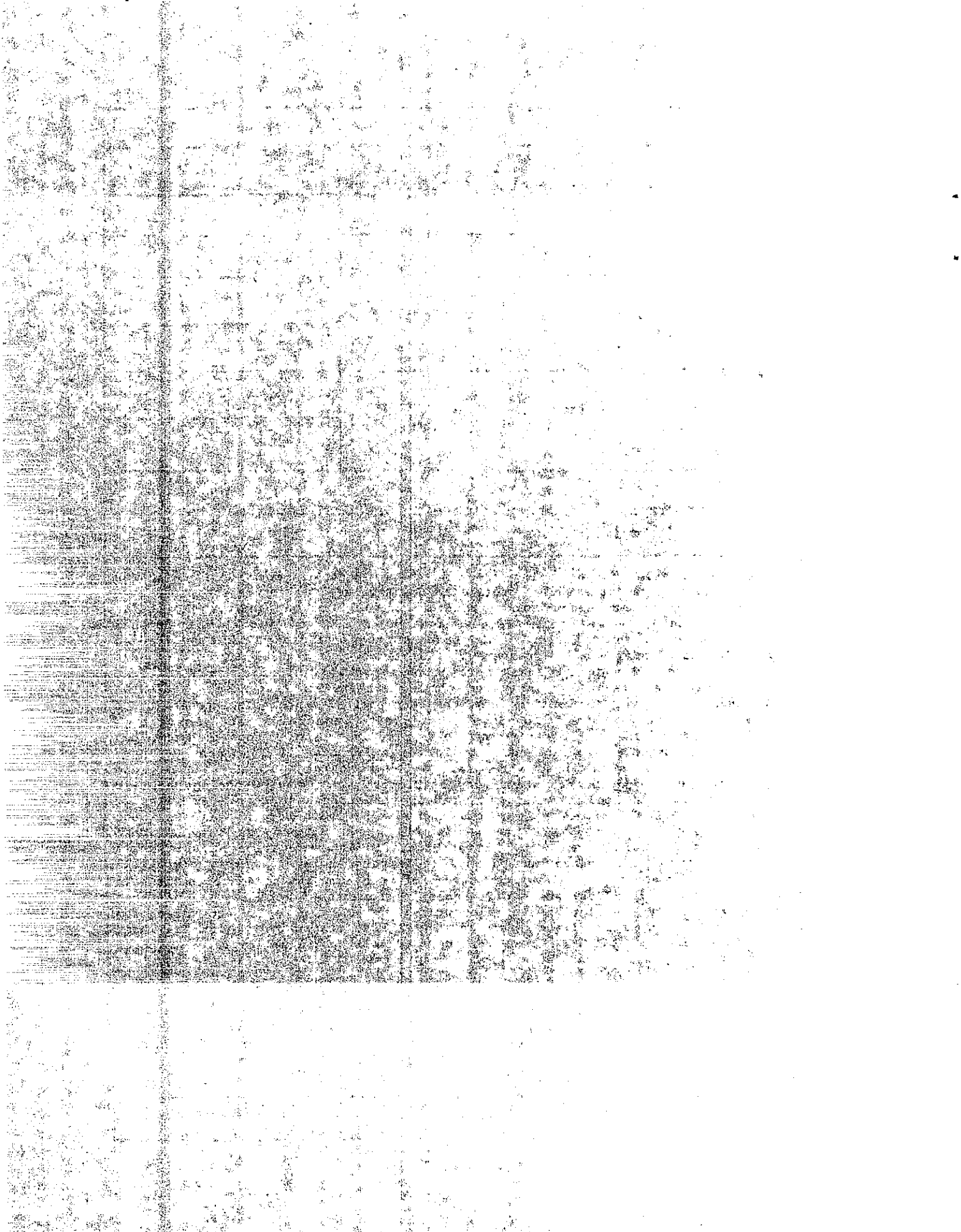

Foreword

This report presents results of a full-scale foundation testing program which was performed by staff of the Office of Geotechnical Engineering under the direction of Wilfred S. Yee in 1986. Results were presented in a report prepared by Mr. Yee dated January 1992 which was sent to FHWA for review. The task of incorporating revisions was subsequently assigned to the current author due to the retirement of Mr. Yee.

The original report prepared by Mr. Yee presented results from both static and dynamic test procedures. The current report focuses exclusively on results from the static load testing program since results from dynamic testing were limited. However, the sections of the original report which dealt with dynamic testing have been compiled, and are presented verbatim as an appendix to this report.

Since the author was not involved with field testing, this report is restricted to describing field conditions which could be extracted from photographs and various written first-hand accounts. However, all numerical results and interpretations have been developed by the author from fully reassembled original data sets and presented in a manner where all interpretations are traceable to these original data.